1.0   **Design Example Datasheet**

Description

Pulse compression is a signal processing technique to increase the signal and noise ratio, detection range and range resolution. It is done so by sending a long wideband signal at transmit, then correlates the receive signal with the transmit signal. When the two signals match in time, a sharp peak is produced.
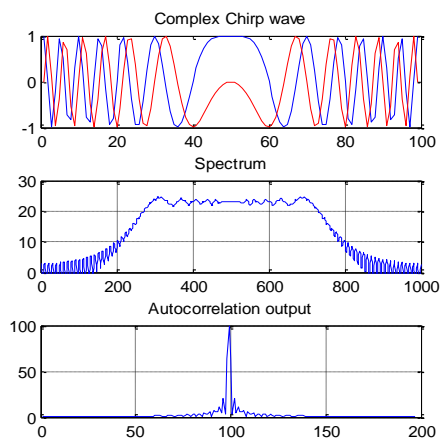
The cross correlation can be performed by time-domain convolution, or FFT-based fast convolution which has lower complexity of order log(N) instead of N, where N is the length of the waveform. Following table shows the multipliers count of both methods.

Linear Conv, N	Log$_2$N	Real mult. per FFT	Total OLS real mult.
16	4	4	20
64	6	8	36
256	8	12	52
1024	10	16	68
4096	12	20	84

However, FFT is block based processing but the radar receive is a streaming one, a technique known as

Overlap-and-Save (OLS), also known as Overlap-and-Discard is used here to partition the input signal and regroup the blocked output to resemble streaming output. OLS is preferred over Overlap-and-Add as adders is not required.

A text book implementation of OLS would retain the front portion of the convolution results. An enhanced version is implemented that retains the more useful middle section of convolution result.

Overlap and Save with (M-1)/2 padding zeros
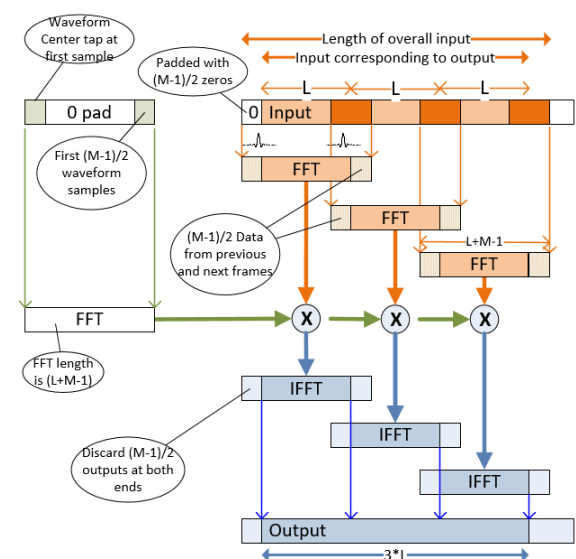
Features

- Custom overlap and save technique to retain the more useful middle portion of the convolution results
- Dynamically configurable FFT size, and waveform size.

Applications

- Generic streaming convolutions
- Pulsed radar, automobile radar

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